

Serial No. 10/567,908

KAS-5191

Amendment

Responsive to Office Action dated April 1, 2009

REMARKS**Pending Claims**

Claims 1, 3, 4 and 6 are pending. Claims 1 and 4 have been amended. No new matter has been added.

Claim for Priority

Applicants respectfully request that the Examiner officially acknowledges the claim for priority of Japanese application No. 2003-421519, and the safe receipt of the certified priority document.

Claim Rejections Under 35 U.S.C. §103

Claims 1, 3, 4, and 6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kanda et al, U.S. Patent No. 6,266,901, in view of Kleineisel, German 197 32 868. Claims 1 and 5 have been amended to clarify that which Applicants regard as the invention.

Applicants request reconsideration of the rejection for the following reasons.

The embodiments of the present invention are directed to providing a swivel joint for a construction machine having a body (e.g., 12) rotating together with a swing structure (e.g., 1) and a spindle 13 mounted to a travel structure 2. The spindle 13 is provided with a mount plate 14 and is mounted to the upper track frame 2a of the travel structure by fixing the mount plate to an edge of an opening 19 formed in the upper track frame 2a. The spindle 13 is rotatably inserted in the body 12 disposed at the center of a swivel race 3 having an inner race 3a and an outer race 3b, which are rotatable relative to each other.

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Fig. 2 shows the swivel joint of the embodiments of the present invention having an upper end surface 12a of a body 12 that is substantially rectangular in shape. Fittings 22 for connecting tubes extending to hydraulic equipment disposed on the swing structure, such as directional control valves for controlling the traveling motors and a blade, are provided on the upper end surface 12a of the body 12. Since the fittings 22 for connecting the tubes or hoses 21 are disposed on the upper end surface 12a of the body 12 in a concentrated layout, there is no requirement for a space between the opening 15 of the swing structure main frame 1 and the body 12 which has been necessary in the prior art for the purpose of allowing passage of the tubes and enabling work such as connection and disconnection of the tubes. As a result, the gap or space between the opening 15 of the swing structure main frame 1 and the body 12 can be kept to a minimum, thereby reducing the amount of earth/sand dropping onto the mount member for the swivel joint 11 and increasing dust resistance of the swivel joint, and prolonging the service life of the grease bath 8 shown in Fig. 1, for example. See page 12, lines 2-28 of the Specification.

As shown in Fig. 3 of the present application, body 12 has thicker wall portions 31, 32 at upper side walls 12b, 12c on the left and right sides, respectively. These thicker wall portions correspond to the tube-connecting fittings 22 disposed on the upper end surface 12a of the body 12, including three on each of the upper and lower sides of the drawing as shown in Fig. 2. Upper ends of the axial passages 33, 34 are opened at the upper end surface 12a of the thicker wall portions 31, 32 to form ports 35, 36 to which the tube-connecting fittings 22 are connected. A number of axial passages ports and tube-connecting fittings are provided in this manner. See page 13, lines 4-15 of the Specification.

Independent claims 1 and 5 have been amended to set forth that the body has thicker wall portions formed respectively in opposed side walls thereof than the other side walls

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thereof, and the plurality of circumferential grooves are formed in a row respectively within the thicker wall portions. Further, claims 1 and 5 set forth that the axial passages are open at an upper end surface of the body to provide a plurality of ports and the plurality of tubes are connected to the plurality of ports whereby the plurality of first tubes are connected to the upper end surface of the body in a concentrated layout.

Kanda is relied upon in the rejection for disclosing the structure of a swivel joint as set forth in claims 1 and 5. However, Kanda does not disclose a structure equivalent to that claimed by Applicants. Mainly, Kanda discloses a two-stage swivel joint 110 for a work machine comprising a lower travel unit (traveling base) 10, a central swiveling unit (first swiveling base) 20 and an upper swiveling unit (second swiveling base) 30. See column 11, lines 1-4 of the reference. The two-stage swivel joint 110 has a cylindrical shaft 111, an upper rotor 112 and a lower rotor 113. See column 15, lines 45-67 of the reference. In Kanda, the lower rotor 113 is attached to the lower travel unit 10. Further, the upper rotor 112 is attached to the central swiveling unit 20 and the cylindrical shaft 111 is attached to the upper swiveling unit 30 (see Figs. 2 and 3). The shaft 111 is inserted in both of the respective center holes 112a, 113a of the upper and lower rotors 112, 113, respectively as shown in Fig. 6.

The shaft 11 of the two-stage swivel joint of Kanda is comparable to the spindle being claimed by Applicants. The upper rotor 112 of Kanda is attached to the central swiveling unit 20 and the lower rotor 113, which is comparable to the body (12) set forth by Applicants in the claimed invention, is attached to the lower travel unit 10 (as is body 12 in the embodiments of the present invention). Accordingly, Kanda discloses a swivel joint in which the lower rotor 113 is attached to the lower travel structure (lower travel unit) 10 and the spindle 111 is attached to the upper swing structure (upper swiveling unit) 30 so as to rotate

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therewith. Accordingly, the swivel joint of Kanda corresponds to a "body fixed type" explained in the Background Art section of the present Specification (page 2, lines 4-7).

In contrast to the body fixed type swivel joint disclosed by Kanda, the swivel joint embodiments of the present invention include a body (12) rotating together with the swing structure (71) 1 and a spindle 13 mounted to the travel structure (70, 2) and rotatably inserted in the body (12). Thus, the swivel joint of the embodiments of the present invention corresponds to the "spindle fixed type" mentioned in the Background Art section of the present Specification (see page 1, last line to page 2, line 4). Accordingly, Applicants respectfully traverse the interpretation of Kanda set forth in the Office Action which states that the reference discloses a swivel joint equivalent to that claimed in Applicants' independent claims.

In particular, the Office Action states that a body 112 of Kanda rotates together with the upper swing structure. However, the reference number 112 denotes an upper rotor in Kanda that is attached to the central swiveling unit 20 and rotates therewith, and the upper rotor 112 does not rotate together with the upper swing structure or upper swiveling unit 30. The Office Action also states that the spindle 111 of Kanda is mounted to the travel structure and is rotatably inserted in the body (comparable to body 12 in the present invention). However, in Kanda the reference number 111 denotes a shaft (spindle) attached to the upper swing structure or upper swiveling unit 30, and the shaft 111 is not mounted to the travel structure or lower travel unit 10.

Applicants also request reconsideration of the interpretation of Kanda with respect to the disclosure of first tubes and second tubes as claimed by Applicants. The Office Action states that a plurality of first tubes 21 are disclosed by Kanda and a plurality of second tubes are connected to the spindle via 125. However, Kanda discloses a plurality of first tubes

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(extending to the hydraulic equipment disposed on the upper swing structure such as valve apparatuses for control of the travel motors and the blade cylinder) that are connected to the shaft spindle 111, but not to the upper rotor 112 or lower rotor (body) 113. Further, the plurality of second tubes, which are tubes extending to the hydraulic equipment disposed on the lower travel structure (travel motors and blade cylinder) are connected to the lower rotor (body) 113 but not to the shaft (spindle) 111. Therefore, Kanda does not disclose the plurality of first and second tubes claimed by Applicants.

With respect to the first tubes and second tubes disclosed by Kanda, Applicants note that Kanda discloses lift cylinder actuators for vertically moving the lift arm 51 and thus a loading bucket 53, however reference number 54 does not denote a blade cylinder. Further, in the comparison of Kanda to the claimed invention, it is stated in the Office Action that the valve apparatus (75, 76) are for control of the travel motors and the blade cylinder. However, reference numbers 75 and 76 denote lower swivel operating valves for driving the lower-stage hydraulic swiveling motor 90 (see Figs. 2 and 9), but not the valve apparatuses for control of the travel motors and the blade cylinder.

The differences between the combination as claimed by Applicants and Kanda are not suggested or disclosed by Kleineisel. Kleineisel is relied upon in the Office Action for disclosing a swivel joint as shown in Fig. 3, wherein a body 4 of the swivel joint includes thicker wall portions in the upper and intermediate portions of body 4 as compared to the lower portion of the body. Further, Kleineisel is relied upon for showing a plurality of axial passages 63a-c communicating with a plurality of circumferential grooves 64a-c formed respectively inside the thicker wall portions. Applicants respectfully traverse the interpretation of the reference as provided in the Office Action, however.

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In particular, the axial passages 63a-63c (or 66a-66c) in Kleineisel are "control pressure passages" which are passages conducting pressure signals, and not passages which relate to main actuator circuits. That is, the passages relied upon in Kleineisel as corresponding the axial passages claimed by Applicants are not passages through which a plurality of first tubes which extend to the hydraulic equipment disposed on the upper swing structure that include the valve apparatuses for control of the travel motors and the blade cylinder, as claimed. Further, Kleineisel does not disclose a plurality of second tubes which extend to the hydraulic equipment disposed on the lower travel structure and including travel motors and a blade cylinder that are coupled to each other in a relatively rotatable manner, as claimed.

The swivel joint of Kleineisel has a rotor 4 configured to have uniform circumferential thickness as shown in Figs. 1-4. Kleineisel does not disclose thicker wall portions (e.g., 31, 32) formed respectively in opposed sidewalls (e.g., 12b, 12c) that are thicker than other sidewalls thereof. Claims 1 and 4 have been amended to clarify this feature. Further, the "axial passages" are claimed to be communicating with the plurality of circumferential grooves that are formed in a row respectively within the thicker wall portions. Kleineisel does not disclose these aspects of the claimed combination.

According to the embodiments of the present invention, improvement in the resistance of dust penetrating the swivel joint and increases in efficiency of the replacement work and reduction in maintenance are achieved by the embodiments of the invention. Further, the arrangement of the present invention enables the reduction of the overall size of the swivel joint structure including the tube-connecting portions and enables a compact layout of the tubes. On the other hand, since the joint of the "body fixed type" disclosed by Kanda has a sliding gap between the body (upper rotor 112 and lower rotor 113) and the spindle (shaft 111)

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that is open at the upper circumferential swivel joint, a problem arises that dust and muddy water including earth/sand and water is apt to enter the sliding gap from the upper swing structure. The swivel joint of the "spindle fixed type" embodied in the present invention, on the other hand, overcomes these problems and prevents dust and muddy water including earth/sand and water from readily entering through the sliding gap. Further since, as a result of the claimed arrangement, fittings are not required to be provided on an outer circumferential surface of the body (12), a gap or space between the opening of the main frame 1 of the swing structure and the body can be made less than before (as discussed in the Background Art section of the Specification) and, as a result, the amount of earth/sand dropping through the gap or space onto the frame of the lower travel structure from the upper swing structure is minimized. Additionally, the arrangement ensures that the amount of dust and muddy water entering the sliding gap between the body and the spindle at the lower end of the body is kept to a minimum.

Applicants note that in the embodiments of the present invention, since the swivel joint of the "spindle fixed type" includes first tubes that are connected to the upper end surface of the body (12) in a concentrated layout and no fittings are provided on the outer circumferential surface of the body, an effective outer diameter of the body is reduced in comparison with that of known structures (as discussed in the Background Art section of the Specification). Further, an overall size of the swivel joint structure including the tube-connecting portions remains compact, according to the arrangement of the embodiments of the invention. That is, since the first tubes are connected to the upper end surface of the body in a concentrated layout and can be positioned within an area defined by the outer diameter of the body, a compact or concentrated layout of the tubes is realized which results in a smaller overall size of the swivel joint structure. Still further, since the first tubes can be

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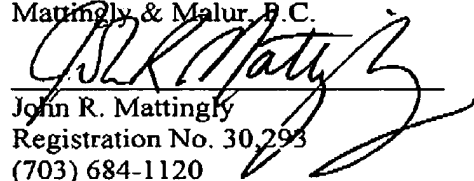
disconnected at a position above the upper end surface of the body (12), the work of disconnecting the tubes can be efficiently facilitated and further replacement of the swivel joint can also be efficiently facilitated. Accordingly, the claimed swivel joint and construction machine having a swivel joint of the present application differs from the combination of Kanda and Kleineisel, and therefore the rejection under 35 U.S.C. §103(a) should be withdrawn.

Conclusion

In view of the foregoing, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

Mattingly & Malur, P.C.


John R. Mattingly
Registration No. 30,293
(703) 684-1120

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